An Application of Constant Market Share Analysis for the Study of Firm Profitability

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Abstract

We propose a new decomposition of the return on investment (ROI) – the main accounting measure of firm profitability – to evaluate the contributions of its three components: the return on sales (ROS), the utilization (*rotation*) of working capital (RCC), and the utilization (*rotation*) of fixed capital (RCF). By using this decomposition we develop an original variant of the *constant market share* (CMS) analysis specifically for comparisons of firm average profitability between countries and over time. The proposed CMS methodology allows us to separate the variation of the average ROI over time (or its difference between two countries) in three components: a *competitiveness effect* – the difference of average ROI assuming the same reference structure for the two terms of comparison – a *structure effect* – the result of the difference in the internal articulation of the ROI by sector and by size structure within the two terms of comparison – and an *adaptation effect*, which takes into account the synergies between the two previous components. The decomposition of the ROI in the product of the three terms, ROS, RCC and RCF, plays an original role in the interpretation of the competitiveness effect. An application of the proposed methodology is carried out for the comparison of the average ROI in the industrial sector among Germany, Italy and France and over the years 2006-2008.

Keywords: constant market share analysis, return on investment, return on sales, rotation of invested capital, comparison over time, comparison over countries.

JEL: C43, M41, L60, L70

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1. Introduction

The study of the links between national account aggregates and firm level private accounting practices could be fruitful to fill the gap between macroeconomic theorizing and a realistic view of the behavior of individual agents. Reconciling corporate measures of profitability and competitiveness and macroeconomic trends of productivity and growth in a country could be crucial to overcome the traditional difficulties in finding the root causes of the decline or success of a national productive system. Indeed, a realistic modeling of individual firm options, strategies and decisions – and its consequences on the competitiveness and development of a national productive system – would be facilitated by a careful analysis of the trends of firm level variables, as measured by standard accounting practices. This is plausible because these phenomena are the most readily accepted performance measures in the business community, and arguably influence both the evaluation that firm management carries out about its past and present performance, and the assessment of financial markets and credit institutions about the profitability and soundness of the business. Such a research program may help to overcome the instrumentalist epistemological practice[1] that characterizes most of the economic theorizing and could be conducive to more realistic assumptions[2] on the economic environment and behaviors.

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[1] Instrumentalism: "*(…) the doctrine of instrumentalism claims that scientific theories are no more than devices, or 'instruments' (in effect, sets of inference rules) for generating predictions about observable phenomena from evidence about such phenomena. This claim can be understood in two ways. It could be that theoretical scientific statements are not, despite appearances, genuine statements at all but rules of inference in disguise, so that the question of their truth (or falsehood) simply does not arise. (…) Alternatively, it could be that, as far as the aims of science go, what matters when evaluating a scientific theory – given that it meets other desiderata such as simplicity, economy, generality of application, and so on – is only its inferential (or instrumental) reliability; its truth or falsehood is of no scientific concern.*" R. Hale (2010).

[2] Realism: "*The dispute between scientific realists and antirealists (…) primarily concerns the status of the theories themselves and what scientists should be seen as trying to accomplish in propounding them. Both sides are agreed that, to be acceptable, a scientific theory should 'save the phenomena' – that is, it should at least be consistent with, and ideally facilitate correct prediction (…). The issue concerns whether theories can and should be seen as attempting more than this. Realists, notably including Karl Popper, J.J.C. Smart, Ian Hacking, and Hilary Putnam, along with many others, have claimed that they should be so viewed: Science aims, in its theories, at a literally true account of what the*

The task of bridging the gap between aggregate economic phenomena and firm level accounting variables is complicated by the need to find aggregation procedures of business measures which could preserve the valuable wealth of information about the heterogeneity of firms characteristics – and among productive sectors and size classes of business units – while providing an efficient synthesis of the main trends of such variables. Particularly, for their relevance in the debate about the importance of key productive sectors and about the size structure (small or medium enterprises versus bigger ones) of entrepreneurial environment for the performance of the whole economic system – e.g. as drivers in technological competitiveness, organizational complexity versus flexibility, innovation and knowledge spillovers to others sector/size classes – the articulations of business variables over sector and size structure are to be preserved as an autonomous source of explicative power.

As a tool which could help to achieve this purpose, we propose the use of a methodology that is well known in the field of international trade to analyze the external competitiveness of a national productive system and the effects of its trade specialization, both in geographical and in sectoral terms. This is the so called *constant market share* (CMS) analysis, which can be applied to whatever phenomenon resulting from an aggregation – or a weighted average – of several classes of homogeneous variables (identified by a well established taxonomy). In our case the main dimensions of such a classification are, eventually, the sector articulation of economic activities and the size classes of enterprises (adequately defined).

The aim of CMS analysis is to separate, by a mathematical decomposition (an identity), the contributions to the time variation of a phenomenon (or to its difference between geographical areas, countries etc.) of the main average trend (or of the main average difference) from that of its internal articulation along sectors and classes meaningfully defined, e.g. its *structure*. It is a decomposition technique "*which owes its success both to the simplicity of its application and to its capacity to emphasize the particular relevance of structural factors that might be otherwise overlooked"* Iapadre (2006). The contribution of Milana (1988) and Guerrieri and Milana (1990) placed for the

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world is like, and accepting those theories involves accepting their ingredient theoretical claims as true descriptions of aspects of reality – perhaps themselves not open to observation – additional to and underlying the phenomena." R. Hale (2010). For realist theorists "*(...) a theory cannot be correct unless it incorporates realist hypotheses. The necessity of abstraction for any successful theorizing does not relieve one of the need to be somewhat descriptive. (...) The adoption of realism as an explicit or implicit methodology has several important consequences. Obviously, standard assumptions become subject to more empirical scrutiny than the evaluation of predictions. (...) What is emphasized is the capacity of a theory to explain the generation of events or structures and to understand the mechanism at work. (...) Now, for a proper story to be told, some casual mechanism must be presented, some casual process must be reconstructed. (...) A natural consequence of this realist approach is that causality becomes a major concern.*" M. Lavoie (1992) pp. 8-9.

first time the methodological issues about CMS analysis within the rigorous framework of index-number theory, but in our specification we prefer to follow the latest developments in Iapadre (1994, 2006), to which we refer for a comprehensive review of the CMS literature.

Among the firm accounting variables, those describing profitability are probably worth being investigated, because they are the most immediate measures describing the economic viability of a business and its creditworthiness, determining the extent of self financing flows, measuring the efficiency of the management in creating value in its current operations (productivity) and by the past investment decisions (strategy and markets); so ultimately they are closely intertwined with both the opportunity and possibility of expansion.

In corporate accounting, the net operating margin (or net operating revenue, RO), and its financial ratio counterpart, the return on investment (ROI, the ratio between the net operating revenue and the net operating capital invested, CIN), are the main measures of the profitability of a firm. Despite the criticism that have been raised against the ROI – that it can be a biased indicator of the internal rate of return of firm investment, that it is influenced by the amortization policies of fixed assets and by inflation – it is arguably the most prevalent measure of profitability to rely on in order to evaluate the performance of business units organized as profit centers. This is because the internal rate of return calculation requires information about the timing of positive/negative cash flows that is not easy to discern even for insiders, as it concerns the discounting of future and uncertain events. Also, the pure immediate monetary return has a valuable information in itself, as it measures the current state of affairs in business profitability which has to be confronted with (and has to compensate) the monetary capital historically invested in the business.

Furthermore, the net operating revenue is an important component of the value added generated by the private sector, and consequently it has a direct accounting relationship with the GNP (or NNP) of national accounts. Compared to national accounting ratios which aim to describe the profitability of the business sector, private accounting ROI is pushed upward by inflation – a feature that is not a weakness in itself[3] – because it relates a flow valued at

[3] The ROI measures the current *monetary* profitability compared to the *historical* cost of the capital invested. The increase in prices of output tends to inflate the revenue while the costs supported in the past remain fixed, and this is an advantage for a firm that succeeds in finding a market for its products at ever increasing prices. So, inflation has to be taken into account as a distinct factor affecting the monetary profitability and the utilization of historical capital, not to be fooled by pure monetary illusions. The changing inflationary environment can severely distort the time series of ROI: e.g. in the first ’90 years, when inflation was rapidly decreasing in Europe, the simple process of substitution of the invested capital at the denominator tended to depress the ROI and the ratio of output on capital valued at cost. This is a natural phenomenon that has nothing to do with productivity or

market prices at the numerator with a stock valued at historical cost at the denominator. But the advantages of ROI over national account measures of profitability (corporate profits divided by fixed capital invested) depend on a more realistic and comprehensive concept of capital invested. Indeed, the ROI measures the capability of current operations to generate a flow of revenue to remunerate the whole *monetary* capital invested (equity and debt capital) independently from the financial structure of productive systems; it implements the distinction between current (*typical*) operations and financial/extraordinary operations (net revenue generated by the credit/debt relations with other economic units and by the revaluation of assets); it realistically takes into account all the components of the net monetary capital invested, fixed capital and net working capital[4].

The paper is organized as follows. In the next section the proposed methodology is presented, highlighting the original contribution of the study. An application of the methodology to the comparison of average ROI, in the private industrial sector, between some countries of the European Monetary Union (Germany, France and Italy), and its time variation over the years 2006-2008 is illustrated in section 3. Section 4 concludes and discusses the prospects for further research.

2. The methodology

The CMS analysis applies to whatever variable can be thought of as a weighted average of more elementary components. To see that this is true for the aggregate ROI in a country or region, let's recall that the aggregate ROI is defined as the ratio between the total net operating revenue (RO) and the total net operating capital invested (CIN) in that country or region,

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efficiency. It is possible to relieve this problem, for time comparisons, by revaluating the net capital invested at book values as

$$CINp(t) = CIN(t) + \sum_{i=1}^{t} (CIN(t-i) - A(t+1-i)) gp(t+1-i) \prod_{j=1}^{i-1} (1 + gp(t+2-j))$$

where $CINp(t)$ is the revalued capital at the end of year t, $CIN(t)$ is the invested capital at book value, $A(t)$ is depreciation at book value in year t and $gp(t)$ is the rate of inflation. The calculation starts at a conventional year 0 to generate a series that is less dependent to the general trend of prices. It has to be beard in mind that *gp* is a "conventional" rate of general inflation and not that of the price of machinery or inventories, because it represents in a pure financial scheme an actualization of the purchasing power of monetary invested capital. When the aim is to do international comparison of the trend of ROI, a difficult decision is which kind of rate of inflation has to be used for the different countries: a national rate of growth of the general level of prices or a common rate for all the countries?

[4] This is the difference between current assets – including inventories, but also liquidity and accounts receivable – and current liabilities – including accounts payable – that find in current operations (e.g. trade credit) their natural source of financing (they are also called "not interest bearing liabilities" or liabilities that find their remuneration in the terms of payment and in the trade credit policies that are established with clients and suppliers).

$$ROI = \frac{RO}{CIN}, \quad RO = \sum_i \sum_j RO_{ij}, \quad CIN = \sum_i \sum_j CIN_{ij}, \tag{2.1}$$

and that these two elements are, in turn, the sums, over sectors and size classes, of net revenue and of net capital invested pertaining to the firms belonging to the different sectors and size classes of the economy. If RO_{ij} and CIN_{ij} indicate, respectively, the aggregate revenue and the aggregate capital invested of the firms that belong to the i-th sector $(i = 1,2,\ldots,N)$ and to the j-th size class $(j = 1,2,\ldots,M)$, the double summation over the indices i and j returns the aggregate revenue and the aggregate capital of the economy as in (2.1). If we substitute these sums in the formula of ROI, it is straightforward to obtain the average ROI in the economy as the weighted average of the ROIs of the different sector/size classes, ROI_{ij}:

$$ROI = \frac{\sum_i \sum_j RO_{ij}}{\sum_i \sum_j CIN_{ij}} = \sum_i \sum_j \frac{RO_{ij}}{CIN_{ij}} \frac{CIN_{ij}}{CIN} = \sum_i \sum_j ROI_{ij} w_{ij}, \tag{2.2}$$

where

$$ROI_{ij} = \frac{RO_{ij}}{CIN_{ij}} \quad \text{and} \quad w_{ij} = \frac{CIN_{ij}}{CIN}. \tag{2.3}$$

w_{ij} is the weight of the ij-th sector/size class in terms of the net operating capital invested.

Equation (2.2) is the starting point for the CMS analysis of the aggregate ROI variation, both over time and between two countries or regions. The first type of analysis – the decomposition of the time variation of average ROI – is useful to collect stylized facts on the time trend of profitability. In particular, it is important to separate the yearly change in profitability that is due to an overall average shift of profitability in the economy from that owing to a modification of the weight or importance of the various sector/size classes in the economy. This distinction makes the analysis of major trends in profitability easier, because it points the attention to the changing structure and specialization of the economy or to global factors, like the national system of innovation, the general infrastructure, institutional factors, etc. which influence the overall national entrepreneurial environment.

The second type of analysis – the decomposition of the difference of average ROI between two countries or regions – is very important in comparative or benchmarking analysis. Indeed, a relative advantage of a country over another could be related to the higher development of some key productive sectors or to the different weight of bigger and more internationalized firms, or also to general differential factors of competitiveness that characterize the entire productive structure.

The interpretations of the CMS decomposition are slightly different in the two types of exercises, and it is better to treat them separately, although the mathematics is the same. To indicate the difference between the two terms of comparison (years or countries) we adopt two different variable superscripts (0 and 1). In the time variation analysis the terms 0 are related to the previous year in chronological order, while in international (regional) comparison 0 refers to the *target* country (region) that has to be confronted to the benchmark (superscript 1). So, for example, the difference between the last year and the first year ROI is $ROI^1 - ROI^0$.

Following Iapadre (2006, equation 18), from (2.2) it is easy to obtain the decomposition (2.4), that is the first original methodological proposal of the present paper, to then apply CMS analysis to a ROI measure of aggregate profitability:

$$ROI^1 - ROI^0 = \underbrace{\sum_i \sum_j (ROI_{ij}^1 - ROI_{ij}^0) w_{ij}^0}_{\text{CE}} + \underbrace{\sum_i \sum_j (w_{ij}^1 - w_{ij}^0) ROI_{ij}^0}_{\text{SE}} + \underbrace{\sum_i \sum_j (w_{ij}^1 - w_{ij}^0)(ROI_{ij}^1 - ROI_{ij}^0)}_{\text{AE}} \quad (2.4)$$

When the difference is between the average ROI of two countries, it is better to multiply both sides of (2.4) by -1, to obtain the 0 terms as the first term of the differences in brackets. Indeed, in international comparisons it is more useful to have the weight of the sector/size classes in the first addend of (2.4) referring to the country on which the analysis is focused (the country 0 that has to be compared to the benchmark country 1). So, it is more natural to formulate the difference as a deviation of the *target* country from the *benchmark* country, and to consider, as the reference weighting structure, that of the *target* country in the first instance (e.g. see Iapadre, 2006, equation 19).

Moving now to the interpretation of the terms in the decomposition (2.4), we still follow the hints from Iapadre (2006), treating separately the case of time comparison and the case of international comparison.

In the decomposition of the time variation of the average ROI the three addends CE, SE and AE represent, respectively, the contribution of the time variation of ij-th class ROIs, the contribution of the variation of the weighting structure, and the interaction of these two phenomena.

- CE is the so called *competitiveness effect* which measures the progress of average ROI *the weighting structure of the economy keeping constant*. It is an hypothetical exercise that puts aside the changing specialization or size structure of the firms, aiming at evaluating the profitability variation of the single units. Obviously, it is related to the structure of the economy in year 0, because the level of CE is higher the more correlated are the time variations of class ROIs with the class weights in the starting year 0, or if

the trend of profitability is more positive and dynamic in the sector/size classes that are more important for the economy.

- SE stands for the *structure effect* and captures the contribution of a changing class structure *keeping the profitability of each sector/size class constant*. Clearly, it is another hypothetical exercise, because the mere transformation of the weight of the sector/size classes could be related to a shift in their profitability margins (e.g. via a shift in competition within markets). It shows to what extent a country or region succeeds in concentrating its productive structure in the most profitable segments of the market. This term has a direct relationship with the sample covariance of the change in the class weights with the level of the class ROIs (see Iapadre, 2006 or Fagerberg and Sollie, 1987): the stronger the linear relation of the weight dynamics with the profitability of the sector/size classes (e.g. because of the greater expansion of the more profitable market segments), the higher the term SE will be.
- AE is the *adaptation effect* and measures the interaction of growth in the class ROIs and in the class weights. It has been defined – in the international trade field – as the degree of flexibility of the productive system or "*a second measure of* (dynamic) *competitiveness*" (Richardson, 1971), because it shows to what extent a country or region succeeds in concentrating its productive structure in the markets segments with the highest growing profitability. It is directly related to the sample correlation between the growth of the class ROIs and the growth of the class weights (see Iapadre, 2006 or Fagerberg and Sollie, 1987).

In the decomposition of the comparison of average ROIs between the target country 0 and the benchmark country 1, the three addends CE, SE and AE represent, respectively, the contribution of the difference of the ij-th class ROIs in a *reference* weighting scheme, the contribution of the comparison of the weighting structures, and the interaction of these two phenomena.

- CE compares the profitability of the two countries imposing as weighting scheme the weights of the target country. It answers the question about the *advantage that the target country would have enjoyed if it had possessed the sector/size class ROIs of the benchmark country* but the same structure that it actually has.
- SE imposes the profitability scheme of the target country to the comparison of the structure between the two countries. It answers the question about the *advantage that the target country would have enjoyed if it had possessed the sector/size structure of the benchmark country* but the same class ROIs that it actually has.
- AE is a measure of the covariance between the differential class ROIs in the two countries and the differential class weights, that is the ability of the target country to exploit its relative profitability advantages over a competing benchmark country by specializing on its more profitable

segments as compared to the benchmark. It enters the (2.4) formula as a term multiplied by -1 (e.g. see Iapadre, 2006, equation 19). A strong *negative* AE indicates that the target country has several market niches in which it is specializing and in which it has strong growing competitive/ profitability advantages in comparison to the benchmark country.

The competitiveness effect, CE, can be further decomposed by using an original composition formula for the ROI. Starting from the traditional Du Pont formula of the ROI, we propose a manipulation to evaluate separately the contribution of the utilization (*rotation*, in technical terms) of fixed capital and the utilization (*rotation*) of working capital. In equation (2.5) the traditional decomposition of the ROI is showed as a product of the ratios ROS (return on sales) and ROC (rotation of capital invested).

$$ROI = ROS \cdot ROC \text{ , where } ROS = RO/V \text{ and } ROC = V/CIN = V/(IMM + CCN) . \quad (2.5)$$

The ROS is the ratio between the net operating revenue and the book value of turnover (or value of production). It represents the profitability margin of sales, and is determined by price/cost factors: degree of market power (product quality/innovation, marketing, distributional arrangements, oligopolistic competition, level of mark-up price policies), productive efficiency in the use of variable factors, efficiency in the organizational and industrial set up (for the part regarding depreciation and amortization costs), advantages in the cost of factors, spreading of fixed costs (depreciation, overhead costs, etc.) over a high level of output.

The ROC is the ratio between the turnover (or value of production) and the net operating capital invested. It measures the degree of utilization and efficiency of the capital invested to obtain a marketable output. It is influenced by technical and organizational efficiency, by the cost of factors and by the effective utilization of capital (that has not to be maintained idle). As the capital invested is composed of fixed operating capital (tangible and intangible fixed assets, IMM) and working operating capital (current operating assets less current operating liabilities, CCN), the rotation of capital invested can be expressed as the product of the rotation of fixed capital (RCF) and of the rotation of working capital (RCC), both multiplied by the same factor α:

$$ROC = RCC \cdot RCF \text{ , where } RCC = \frac{V}{CCN} \cdot \alpha \text{ , } RCF = \frac{V}{IMM} \cdot \alpha \text{ and } \alpha^2 = \frac{CCN \cdot IMM}{V \cdot (CCN + IMM)} \quad (2.6)$$

Therefore, the ROI is equal to

$$ROI = ROS \cdot RCC \cdot RCF . \quad (2.7)$$

Substituting (2.7) for the ROI in the CE addend of the (2.4) and performing some algebra, it is possible to obtain an interesting decomposition of the competitiveness effect:

$$\begin{aligned}\mathbf{CE} = & \underbrace{\sum_i \sum_j (ROS_{ij}^1 - ROS_{ij}^0) RCC_{ij}^0 RCF_{ij}^0 w_{ij}^0}_{\mathbf{CEros}} + \\ & + \underbrace{\sum_i \sum_j (RCC_{ij}^1 - RCC_{ij}^0) ROS_{ij}^0 RCF_{ij}^0 w_{ij}^0}_{\mathbf{CErcc}} + \\ & + \underbrace{\sum_i \sum_j (RCF_{ij}^1 - RCF_{ij}^0) ROS_{ij}^0 RCC_{ij}^0 w_{ij}^0}_{\mathbf{CErcf}} + \mathbf{CEres}\end{aligned} \tag{2.8}$$

where

$$\begin{aligned}\mathbf{CEres} = & \sum_i \sum_j (ROS_{ij}^1 - ROS_{ij}^0)(RCC_{ij}^1 - RCC_{ij}^0) RCF_{ij}^0 w_{ij}^0 + \\ & + \sum_i \sum_j (RCC_{ij}^1 - RCC_{ij}^0)(RCF_{ij}^1 - RCF_{ij}^0) ROS_{ij}^0 w_{ij}^0 + \\ & + \sum_i \sum_j (ROS_{ij}^1 - ROS_{ij}^0)(RCF_{ij}^1 - RCF_{ij}^0) RCC_{ij}^0 w_{ij}^0 + \\ & + \sum_i \sum_j (ROS_{ij}^1 - ROS_{ij}^0)(RCC_{ij}^1 - RCC_{ij}^0)(RCF_{ij}^1 - RCF_{ij}^0) w_{ij}^0\end{aligned} \tag{2.9}$$

The first three terms, CEros, CErcc and CErcf, are unequivocally the contribution to CE of the differential ROS, RCC and RCF between the two years 1 and 0 (or between the target country 0 and the benchmark country 1). The last term, CEres, is an interaction term that measures the synergy among the three previous effects. It is higher the more the differences between the two years of comparison (or between the two countries) in the ROS, RCC and RCF widen jointly, or when the comparative advantages in the different aspects of profitability are concentrated in the same market segments.

The SE term in the (2.4) also can be further decomposed following Iapadre (2006, equation 21). To do this, we need to introduce some more definitions.

$$ROI_{i.} = \sum_j ROI_{ij} \frac{CIN_{ij}}{\sum_j CIN_{ij}} \text{ and } ROI_{.j} = \sum_i ROI_{ij} \frac{CIN_{ij}}{\sum_i CIN_{ij}}. \tag{2.10}$$

$ROI_{i.}$ is the average ROI of the i-th sector of the economy, that is the weighted average of the ROIs of the size classes in which it is articulated, the weights being the shares in the capital invested in the i-th sector of the size classes of the firms belonging to this sector. $ROI_{.j}$ is the average ROI of the j-th size class of the economy, that is the weighted average of the ROIs of the productive sectors in which it is articulated, the weights being the shares in the capital invested in the j-th size class of the firms belonging to the different sectors.

$$p_{i.} = \frac{\sum_j CIN_{ij}}{\sum_i \sum_j CIN_{ij}},\ g_{.j} = \frac{\sum_i CIN_{ij}}{\sum_i \sum_j CIN_{ij}} \text{ and } d_{ij} = \frac{w_{ij}}{p_{i.} \cdot g_{.j}}. \tag{2.11}$$

$p_{i.}$ is the weight of the i-th productive sector in the economy, in terms of the net capital invested. $g_{.j}$ is the weight of the j-th size class in the economy, in terms of the net capital invested. d_{ij} is the, so called, *structural diversification index* (SDI) of the ij-th sector/size class. It shows to what degree the weight of the ij-th sector/size class depends on an idiosyncratic distribution of the size structure in the i-th sector that advantages/disadvantages the j-th size class when the SDI is greater/lower than 1. Paraphrasing Iapadre (2006) *the SDIs reveal the degree of reciprocal dependence between the structure of sector articulation of the economy and the size structure of firms environment, and show if the size classes of firms are uniformly distributed among the various sectors or instead tend to be concentrated in some of these. In the extreme case in which all the SDIs are equal to one, the sector (or the size classes) distribution of capital invested would result equal in all size classes (or in all sectors)*.

Bearing in mind these new notations, following Iapadre (2006, equation 21) it is possible to decompose the SE term of equation (2.4), as shown below:

$$\mathbf{SE} = \underbrace{\sum_{i} (p_{i.}^{1} - p_{i.}^{0}) ROI_{i.}^{0}}_{\mathbf{CSE}} + \underbrace{\sum_{j} (g_{.j}^{1} - g_{.j}^{0}) ROI_{.j}^{0}}_{\mathbf{GSE}} + \mathbf{SIE}\,, \tag{2.12}$$

where

$$\begin{aligned} \mathbf{SIE} = & \sum_{i}\sum_{j} (d_{ij}^{1} - d_{ij}^{0}) p_{i.}^{0} g_{.j}^{0} ROI_{ij}^{0} + \\ & + \sum_{i}\sum_{j} (p_{i.}^{1} - p_{i.}^{0})(g_{.j}^{1} - g_{.j}^{0}) d_{ij}^{0} ROI_{ij}^{0} + \\ & + \sum_{i}\sum_{j} (p_{i.}^{1} - p_{i.}^{0})(d_{ij}^{1} - d_{ij}^{0}) g_{.j}^{0} ROI_{ij}^{0} + \\ & + \sum_{i}\sum_{j} (p_{i.}^{1} - p_{i.}^{0})(g_{.j}^{1} - g_{.j}^{0})(d_{ij}^{1} - d_{ij}^{0}) ROI_{ij}^{0} \end{aligned} \tag{2.13}$$

- The CSE term is the *sector structure effect*, that is the time change of the average ROI that would have occurred *if the sector structure alone had been changed in the last year 1 (the size structure being constant in all the sectors), with the same profitability records of class ROIs as in the first year 0*. In a comparison exercise between two countries this term represents the hypothetical advantage that the target country 0 would have had in profitability *if it had possessed the same sector weight of the benchmark country 1 (and its own size structure in all the sectors), but all its own class ROIs*.
- The GSE term is the *size structure effect*, that is the time change of the average ROI that would have occurred *if the size structure had been changed in the last year 1 (the sector structure being constant in all the size classes), with the same profitability records of class ROIs as in the first year*

0. In a comparison exercise between two countries this term represents the hypothetical advantage that the target country 0 would have had in profitability *if it had possessed the same size weight of the benchmark country 1 (and its own sector structure in all the size classes), but all its own class ROIs*.

- The residual term SIE, the *structural interaction effect*, measures the synergy among the differences in the sector structure and in the size structure between the years 1 and 0 or between the target country and the benchmark country. The SIE depends on the way changes in the sector and size structure of the economy interact (or the differences in the sector and size structure between the target country and the benchmark country reinforce each other because of the presence of market segments or niches specifically characterizing the entrepreneurial environment of a country comparing to another[5]).

3. An application to the comparison of the profitability of European firms between countries and over time

In this section we use the methodology illustrated in the previous section to analyze the differences in industry profitability among three different European countries (Germany, France and Italy, with Italy as the target country of the analysis) and over the years 2006-2008.

We use the data from the BACH (Bank for the Accounts of Companies Harmonized) with a two digits NACE rev 2 classification of economic activities and a distinction of three size classes of firms based on the level of net turnover (less than 10 million euros, from 10 to 50 million, more than 50 million). The BACH was started in 1985 by the General Directorate for Economic and Financial Affairs of the European Commission. "*The BACH project was based on the idea of exploiting information supplied by the national Balance Sheet Data Offices, which use companies' individual accounts and therefore provide more detailed information than that available in National Accounts. (...) The attempts to harmonize BACH are part of a broader effort to harmonize financial statements within the European Union, mainly in application of two Directives: the Fourth Directive on financial statements of 1978 and the Seventh Directive on consolidated financial statements of 1983. (...) Owing to a*

[5] This phenomenon could be related to the granularity of the sector classification adopted in the analysis. Sometimes, the available disaggregation of data or the official classifications of economic activities do not grasp completely the particularity of all the technological/market articulation of the productive system, and so the superimposition of the size classification identifies true different sectors of the economy, with different products, different productive process an a different market structure. In this case the distinction of sector classes and size classes loses importance and the economy can be thought of as a set of different sector/size niches characterized by different profitability and market logics.

lack of sufficient and comparable information within the national annual accounts layouts, the layout proposed for BACH is less detailed than the set out in the Fourth Directive. The scheme includes several adjustments in the presentation of data. (…) Harmonization work has been at the centre of this project and comparability has remained its main target, occasionally at the cost of a reduction in the amount of detailed information. However, it has not been possible to harmonize the data fully owing to the special characteristics of the national accounting methodologies and the difficulty of drawing up accounting documents a posteriori using a common layout." Banque de France and ECCBSO (2010).

Despite these harmonization problems, the BACH allows containing within adequate limits the accounting differences among the EMU countries and to compare, by a careful analysis of the entrepreneurial national environments and their accounting standards, the different performances of the productive systems in these countries (Caprio and Inzerillo, 2002). The BACH accounting scheme and the details of the calculation of the ratios ROI, ROS, RCC and RCF are reported in the appendix.

3.1 Comparisons of the profitability of the industrial sector in Italy versus Germany and France

In the years 2006-2008, according to our elaborations on BACH data, the average ROI amounted to 8.4% in Italy, 9.6% in Germany and 11.4% in France. Profitability increased in 2007 in all three countries and then decreased to a lower level, a percentage point below than the 2006 figures, with the onset of a deep global economic crisis in 2008. A distinctive feature of the Italian ROI over time (other than its lower overall average level) seems to be its lower sensitivity to the economic cycle. Indeed, in 2007, when the profitability outlook improved in all countries, in Italy the ROI increased only by 0.5 percentage points while in Germany and France it picked up by 2.2-2.4%. In 2008, when the beginning of the crisis shattered the profitability of EMU firms, the ROI collapsed by 3.2-3.7 percentage points in Germany and France, but only by 2.2% in Italy, possibly due to a productive system that seems less capable to take advantage of expansion opportunities, but perhaps it is also more resilient to sudden changes in markets outlooks. It has to be noted that, while in the "good" year 2007 the ROI increased in Italy 1.8 percentage points less than the German-French average increase, in the "bad" year 2008 the decrease was only 1.3 percentage points lower than the German-French average reduction, so overall the Italian competitive position seems to have been worsened compared to its major EMU partners from 2006 to 2008.

Tab. 1: Productive sectors weighted average ROI (%)

Sector, NACE rev. 2	year 2006			year 2007			year 2008		
	Germany	France	Italy	Germany	France	Italy	Germany	France	Italy
Manufacture of food, beverages and tobacco products	11.3	14.7	7.3	10.0	15.2	7.3	8.6	13.9	6.4
Manufacture of textiles, wearing apparel, leather and related products	8.6	10.8	7.8	9.1	13.1	8.4	8.2	9.9	5.9
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	10.0	9.8	6.9	9.0	11.8	7.4	3.0	9.4	4.0
Manufacture of paper and paper products	6.6	2.2	5.3	7.2	5.7	6.3	5.8	5.1	6.0
Printing and reproduction of recorded media	11.0	4.1	5.7	11.3	6.4	4.3	7.7	4.5	3.9
Manufacture of coke, refined petroleum products, chemicals and chemical products	11.0	6.7	5.4	12.0	10.2	8.5	9.5	5.1	3.3
Manufacture of basic pharmaceutical products and pharmaceutical preparations	24.8	17.1	12.0	25.1	12.2	12.6	22.1	14.1	12.3
Manufacture of rubber and plastic products	13.4	8.1	5.5	13.4	9.0	6.8	10.3	7.7	3.4
Manufacture of other non-metallic mineral products	10.5	14.8	9.1	9.1	16.7	8.5	8.2	11.7	4.0
Manufacture of basic metals	17.6	11.6	11.2	25.9	23.0	15.6	20.4	7.6	7.3
Manufacture of fabricated metal products, except machinery and equipment	12.6	11.9	10.3	14.2	12.6	11.4	13.5	12.4	9.8
Manufacture of computer, electronic and optical products	-4.5	5.9	7.0	-1.9	2.8	5.6	1.3	2.3	5.5
Manufacture of electrical equipment	11.7	11.7	11.8	12.7	11.5	13.0	14.2	11.1	10.8
Manufacture of machinery and equipment n.e.c.; repair and installation of machinery and equipment	14.6	12.6	10.4	16.8	14.4	12.5	15.9	14.1	11.6
Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment	2.7	14.9	7.4	10.8	16.2	6.3	-1.1	8.3	6.2
Manufacture of furniture	11.0	7.8	7.1	10.0	8.2	6.3	14.4	8.7	4.7
Other manufacturing	17.9	9.5	7.5	17.6	9.7	8.7	17.1	10.7	6.7
Electricity, gas, steam and air conditioning supply	9.2	6.5	11.1	11.7	11.4	9.0	5.0	5.2	9.6
Construction of buildings	6.3	10.3	8.8	0.2	9.1	8.0	4.6	7.0	6.9
Civil engineering	4.9	6.3	5.6	7.7	6.8	7.9	7.8	6.1	3.6
Specialized construction activities	6.6	14.2	9.2	9.6	15.6	9.6	14.8	16.0	8.5
Mining and quarrying	11.7	35.6	23.6	4.4	42.5	16.6	7.1	46.2	10.9
Water supply; sewerage, waste management and remediation activities	5.5	7.2	4.2	6.3	7.4	4.5	6.5	6.9	2.9
Mean, unweighted	**10.2**	**11.1**	**8.7**	**11.0**	**12.7**	**8.9**	**9.8**	**10.6**	**6.7**

Source: our elaboration on BACH data, years 2006-2008

Tab. 2: Firm size classes weighted average ROI (%)

Size classes based on turnover	year 2006			year 2007			year 2008		
	Germany	France	Italy	Germany	France	Italy	Germany	France	Italy
Less than 10 Millions euro	11.3	10.1	5.1	11.8	11.4	4.7	11.8	10.7	2.7
From 10 to 50 Millions euro	11.2	9.7	7.5	11.6	11.0	8.2	11.5	10.1	6.3
Over 50 Millions euro	8.9	11.4	9.7	11.7	14.1	10.2	7.3	9.8	7.9
Mean, unweighted	**10.4**	**10.4**	**7.4**	**11.7**	**12.2**	**7.7**	**10.2**	**10.2**	**5.6**

Source: our elaboration on BACH data, years 2006-2008

The average sector and size classes ROIs in the three countries are reported, respectively, in table 1 and table 2 above. Analyzing table 1, it is apparent that the Italian sector ROIs (average 2006-2008) range from 17% (Mining and quarrying) to 3.9% (Water supply, sewerage, waste management and remediation activities) and that they are generally lower than the sector ROIs of the two EMU partners. The Italian sectors with the highest ROIs are: Mining and quarrying, Manufacture of basic pharmaceutical products and pharmaceutical preparations, Manufacture of electrical equipment, Manufacture of machinery and equipment n.e.c., Manufacture of basic metals, Manufacture of fabricated metal products, except machinery and equipment, Electricity, gas, steam and air conditioning supply. The lowest ROIs are in: Manufacture of paper and paper products, Manufacture of coke, refined petroleum products, chemicals and chemical products, Civil engineering, Manufacture of rubber and plastic products, Printing and reproduction of recorded media, Water supply; sewerage, waste management and remediation activities.

The profitability of Italian sectors seems to have a stronger linear relationship with the profitability of French sectors, as measured by the correlation coefficient between sector ROIs (0.78), than with the profitability of German sectors (the correlation coefficient is 0.43). However, the (unweighted) average ROI of French productive sectors is much higher than the Italian average, as compared to the Italian-German difference.

Similarly the correlation between the sector weights in Italy and France (0.83) is higher than the Italian-German correlation (0.66), and the average absolute distance between the Italian and French weights (1.5%) is lower than the average absolute Italian-German distance (2.4%)[6]. Therefore, it seems that, regarding the articulation of profitability and the structure of sector weights in capital invested, there are some similarities between Italy and France, more than between Italy and Germany.

The relative advantages/disadvantages in profitability of Italian industry are very different if the national productive system is compared to the German or to the French industrial sector. Indeed, the correlation coefficient between the Italian and German ROI differences and Italian and French ROI differences, in the corresponding sectors, is even negative (-0.33). This is confirmed by the list of the Italian sectors that outperform the German and French corresponding sectors[7]. The two digits divisions that outperform in Italy the German ROI are

[6] The average weight being 4.3% (1/23) owing to a two digits classification of economic activities articulated in 23 sectors.

[7] It is possible that the loose granularity of the NACE rev. 2 classification at the second digit actually doesn't grasp the real specificity of the Italian, German and French sectors, or that what are rubricated in the same class of activity are not really the same sectors. This weakness of the available information cannot be overcome due to BACH's data limitations. Perhaps, within these two digits divisions, some size classes actually indicate different sectors of activity.

(2006-2008 average): Mining and quarrying, Manufacture of computer, electronic and optical products, Construction of buildings, Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment, Electricity, gas, steam and air conditioning supply. The two digits divisions that outperform in Italy the French ROI are instead: Manufacture of computer, electronic and optical products, Electricity, gas, steam and air conditioning supply, Manufacture of paper and paper products, Manufacture of electrical equipment. Only Electronic and optical products is an item present in both the lists because it contains the small segment (2.3% of the capital invested in Italian economy compared to 6.8% in Germany and 2.4% in France) of precision and medical instrument that is one of the spearheads of Italian advanced mechanics.

Similarly, there are no resemblances between the lists of the Italian sectors that severely underperform (by more than 4%) the corresponding German and French sectors. For the Italian-German comparison they are (in order of decreasing differential performance): Manufacture of machinery and equipment n.e.c., Manufacture of coke, refined petroleum products, chemicals and chemical products, Printing and reproduction of recorded media, Manufacture of furniture, Manufacture of rubber and plastic products, Other manufacturing, Manufacture of basic metals, Manufacture of basic pharmaceutical products and pharmaceutical preparations. For the Italian-French comparison they are, instead: Manufacture of wood and of products of wood and cork, except furniture, Specialised construction activities, Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment, Manufacture of other non-metallic mineral products, Manufacture of food, beverages and tobacco products, Mining and quarrying.

Finally, the data do not support any kind of linear relationship between the differential weights of the two digit sectors in the economies (Italian-German comparison and Italian-French comparison) and their differential profitability over the period (2006-2008). The correlation between the differences is mild and even negative (-0.15 for the comparison between Italy and Germany, -0.06 for the comparison between Italy and France).

Table 2 shows the average ROI of the Italian, German and French firms that belong to the three size classes available from the BACH: (1) firms with a net turnover lower than 10 million euros; (2) firms with a net turnover higher than 10 million and lower than 50 million euros; (3) firms with a net turnover higher than 50 millions euro. The most penalized size class in Italy, in terms of profitability, both when compared to the other size classes of Italian economy or when compared to the corresponding size class abroad, is the smaller one. In Italy, according to the BACH's 2006-2008 data, there is a clear dominance of the bigger firms over the smaller ones, while this is not the case in the German or in the French economies: in Italy the third size class has an average ROI that is more than double that of class 1. The medium class, also, has in Italy a ROI significantly smaller (by 2%) than the bigger firms class. This is a notable

difference with the findings of Caprio and Inzerillo (2002), referred to the 1982-1999 period. They show that the medium sized Italian firms have a ROI that (except for the textiles and fashion industry) is comparable to the foreign based firms and even better than the ROI of the bigger Italian firms[8]. Also in dynamic terms, the size class 1 is the most penalized in the Italian context from 2006 to 2008 (-2.8%), while in the other two countries the most penalized is the class 3.

In terms of net operating capital invested, the Italian economy has notably a much smaller weight in the bigger size class and a higher weight in the medium size class than the two foreign competitors. The economy most focused on big firms is Germany. However, in all three economies the BACH's sample is concentrated on size class 3 (from 64.8% to 84.1% of the total net capital invested).

Coming to talk about the primary focus of this exercise, the comparisons of the average ROI performances between Italy and Germany and between Italy and France are reported, respectively, in tables 3 and 4 (see next page). The unfavorable difference between Italian and French ROI, over the whole period 2006-2008, is more than twice the difference between Italian and German ROI (-3% versus -1.3%). In both comparisons the main role is played by the competitiveness effect, CE, and a significant level is attained by the "adaptation" term, AE, while the order of magnitude of the structure effect, SE, is minor and does not always exhibit a clear sign over the years. Overall, the structure effect seems to be positive for the Italian-French comparison and negative for the Italian-German comparison – thanks mostly to a German size structure that is concentrated in the bigger size class 3 (the most profitable in the Italian enterprise environment) and that limits the weight of the smaller size class 1 (the least profitable in Italy). The structural interaction effect seems to

[8] The results are not directly comparable because of the different time period of reference and a different concept of the capital invested. While in the Caprio and Inzerillo (2002) study the capital invested, at the denominator of the ROI, equals total balance sheet assets (AE) less financial fixed assets (C3) and current investments (D3), in this analysis we take into account a more strict concept of capital by subtracting also working operating liabilities (accounts payable and trade credit, F3, F4 and I4, provisions for pensions and similar obligations, J1, and accruals and deferred income, K) that find in current operations their natural finance source.

favor Italy in both comparison exercises, probably because of the presence of some sector/size market niches that characterize the strengths of this economy.

Tab 3: Constant market share decomposition of the difference between Italian and German ROI (%)

CMS decomposition	Items	year 2006	year 2007	year 2008	Mean 06-08
Totals	ROI, total: Italy	8.7	9.3	7.1	8.4
	ROI, total: Germany	9.3	11.7	7.9	9.6
	ROI, total: Italy - Germany	**-0.5**	**-2.4**	**-0.9**	**-1.3**
Competitiveness effect	**CE, total**	**-1.4**	**-2.2**	**-2.1**	**-1.9**
	ROS contribution	0.2	0.2	0.1	0.2
	RCC contribution	0.0	-0.3	0.1	-0.1
	RCF contribution	-4.3	-3.3	-4.6	-4.0
	Interaction	2.7	1.2	2.3	2.1
Structure effect	**SE, total**	**-0.3**	**0.2**	**-1.1**	**-0.4**
	Sector structure	-0.2	0.3	-0.7	-0.2
	Size structure	-0.5	-0.5	-0.5	-0.5
	Interaction	0.4	0.5	0.1	0.3
"Adaptation" effect	**AE, total**	**1.1**	**-0.4**	**2.4**	**1.0**

Source: our elaboration on BACH data, years 2006-2008

Tab 4: Constant market share decomposition of the difference between Italian and French ROI (%)

CMS decomposition	Items	year 2006	year 2007	year 2008	Mean 06-08
Totals	ROI, total: Italy	8.7	9.3	7.1	8.4
	ROI, total: France	11.0	13.2	10.0	11.4
	ROI, total: Italy - France	**-2.3**	**-3.9**	**-2.9**	**-3.0**
Competitiveness effect	**CE, total**	**-2.8**	**-5.2**	**-4.2**	**-4.1**
	ROS contribution	-2.6	-3.5	-3.0	-3.0
	RCC contribution	0.4	0.0	0.2	0.2
	RCF contribution	-1.7	-2.2	-2.2	-2.0
	Interaction	1.0	0.5	0.9	0.8
Structure effect	**SE, total**	**0.2**	**0.6**	**0.2**	**0.4**
	Sector structure	0.1	0.4	0.1	0.2
	Size structure	0.0	0.1	0.1	0.0
	Interaction	0.1	0.1	0.1	0.1
"Adaptation" effect	**AE, total**	**0.4**	**0.6**	**1.0**	**0.7**

Source: our elaboration on BACH data, years 2006-2008

The bulk of the difference among the profitability of national productive systems is within the CE term. The most striking result is the strong negative contribution of the rotation of fixed capital, RCF, particularly in comparison to the German economy (the effect is in this case twice than in the Italian-French comparison). This stylized fact is in accordance with the lower Italian productivity of capital highlighted by Caprio and Inzerillo (2002). The negative effect of RCF appears fairly stable in comparison to the French economy and counter cyclical in comparison to the German economy[9]. Perhaps a working hypothesis could be that Germany has a fixed capital utilization rate higher on average than Italy, and so it is more difficult for the German industry to raise the rotation of fixed capital in periods of high demand. In those periods the RCF unfavorable effect would tend to shrink. According to this hypothesis, part of the relative inefficiency of the rotation of fixed capital in Italy compared to Germany could be related to a relatively worse planning and deploying of productive plants in the face of demand, that result in a lower average utilization ratio. The Italian-French comparison does not seem to be affected by such phenomenon, and thus the relatively higher rotation of fixed capital could be traced mainly to other causes. There are several alternative working hypotheses.

The contribution of the ROS is very strong and negative only in comparison to France, where it appears to be the main unfavorable factor in the Italian economy. The ROS negative contribution in the Italian-French comparison seems to be rather pro-cyclical. The ROS is related to the profit margin over sales and therefore it is driven by the price-cost margin: it is a matter of technical cost efficiency but also of market power – and so, for example, it is an issue of dynamic technical efficiency, that is technical and organizational innovation over time. Is this a sign of a higher "market power" of French firms compared to Italian firms or a better cost efficiency, or something else? This is still an open issue.

The contribution of the rotation of working capital, RCC, does not seem a primary competitiveness factor among the three economies. The interaction of the three components – ROS, RCF and RCC – in the various sector/size niches brings up a positive contribution to the Italian economy in both exercises, perhaps because of the existence of some profitable market segments in which the various components appear together with a positive sign.

The AE component is on average positive and significant for the Italian economy in both exercises (about 1 percentage point).

[9] Obviously, due to the severe limitation of the time sample, this is only a hint.

Tab 5: Constant market share decomposition of the difference between 2007 and 2006 ROI (%)

CMS decomposition	Items	Germany	France	Italy	Mean
Totals	ROI, total: 2006	9.3	11.0	8.7	9.7
	ROI, total: 2007	11.7	13.2	9.3	11.4
	ROI, total: 2007 - 2006	**2.4**	**2.2**	**0.5**	**1.7**
Competitiveness effect	**CE, total**	**2.2**	**2.2**	**0.3**	**1.6**
	ROS contribution	2.0	1.0	0.3	1.1
	RCC contribution	-0.1	0.1	-0.4	-0.2
	RCF contribution	0.4	1.1	0.6	0.7
	Interaction	-0.1	0.0	-0.1	-0.1
Structure effect	**SE, total**	**-0.1**	**0.3**	**0.3**	**0.2**
	Sector structure	-0.1	0.3	0.2	0.1
	Size structure	0.0	0.0	0.0	0.0
	Interaction	0.1	0.0	0.1	0.0
"Adaptation" effect	**AE, total**	**0.2**	**-0.2**	**-0.1**	**0.0**

Source: our elaboration on BACH data, years 2006-2008

Tab 6: Constant market share decomposition of the difference between 2008 and 2007 ROI (%)

CMS decomposition	Items	Germany	France	Italy	Mean
Totals	ROI, total: 2007	11.7	13.2	9.3	11.4
	ROI, total: 2008	7.9	10.0	7.1	8.3
	ROI, total: 2008 - 2007	**-3.7**	**-3.2**	**-2.2**	**-3.1**
Competitiveness effect	**CE, total**	**-3.5**	**-3.2**	**-1.9**	**-2.9**
	ROS contribution	-3.6	-3.0	-1.6	-2.7
	RCC contribution	0.0	0.3	0.7	0.3
	RCF contribution	0.0	-0.5	-0.9	-0.5
	Interaction	0.0	0.0	-0.1	0.0
Structure effect	**SE, total**	**0.2**	**0.1**	**-0.1**	**0.1**
	Sector structure	0.2	0.1	-0.1	0.0
	Size structure	0.0	0.0	0.0	0.0
	Interaction	0.0	0.0	0.0	0.0
"Adaptation" effect	**AE, total**	**-0.4**	**-0.1**	**-0.2**	**-0.2**

Source: our elaboration on BACH data, years 2006-2008

3.2 Time variation of the profitability of the industrial sector in Italy, Germany and France over the years 2006-2008

A comparison over time of the profitability of German, French and Italian firms in industry is reported in tables 5 and 6. Table 5 shows the growth of the average ROI between the years 2006 and 2007, while table 6 illustrates the sudden drop in the average ROI between 2007 and 2008, with the beginning of the worst economic crisis in decades.

In Italy, the average ROI increased a little in 2007, but dropped by nearly two percentage points in the first year of the crisis; a behavior that is in sharp contrast with the other two countries. Furthermore, only 0.3% of the increase is due to the competitiveness effect, and another 0.3% to the structure effect. It is worth noting that in the "expansionary" year 2007 the positive RCF effect is the highest contribution to the improvement of profitability in Italy, as if the higher demand helped to reduce the chronic under utilization of fixed capital – an issue that deserves further research in itself. The Italian RCF contribution in 2008 is the highest, in absolute terms, among all three countries, where it becomes negative probably because of the drop in demand. The same effect is important in France – mostly in 2007 – but not in Germany.

Moreover, unlike Italy, in Germany and France the ROS contribution is quite important both in 2007 and in 2008, as if there would have been a stronger reaction of the price-cost margins to the economic cycle than in Italy. Is this phenomenon due to more flexible price policies determined by more competitive internal markets in Germany and France, or to something else? This is another interesting issue open for investigation.

Another interesting issue is the seemingly counter cyclical behavior of the RCC contribution in the Italian economy; something that cannot be observed in the two other countries.

Finally, the adaptation effect appears to have relatively minor consequences in all the contexts.

4. Conclusions

In this paper we have proposed to apply the methodology of constant market share analysis to the study of the dynamics over time of the ROI – the main accounting measure of business profitability – and also for the benchmarking of the profitability of a national productive system to a reference national system.

By separating the competitiveness effect from the other factors that influence the comparisons, it is possible to better evaluate the relative performance of a productive system, provided that one can discern the distinct contribution of the possibly different accounting standards and find a method to alleviate the distortive impact of inflation on the accounting of capital invested at book values.

The competitiveness effect, or the change of profitability within each sector/size class of the economy, seems to be the main driver of overall profitability. The main original contribution of the author is to have developed the CMS analysis of the entrepreneurial profitability by further breaking down the competitiveness effect to the three components of the ROI: the return on sales, ROS, the rotation of fixed assets, RCF, and the rotation of net working assets, RCC. In this way, it is possible to open the black box of economic entrepreneurial productive activity with the aim of distinguishing the main contributions of both productive efficiency and price-cost margin. Interesting insights emerge national productive systems are compared over time in order to bring out their main qualitative differences. But the wealth of stylized facts that could be collected is only a first step to begin the investigation on some realistic explanations of the phenomena. Such investigation could be undertaken only by a careful study of the "institutional" (or qualitative) characteristics of the nations, highlighting their relative decline or success.

For example, the relative disadvantage of the Italian industry in terms of the rotation of fixed capital – that is highlighted in the applied analysis – could be further analyzed in comparison to other national systems and on a longer time span. It would then be possible to investigate what kind of accounting item is responsible for this unfavorable effect. The time trend of the rotation of fixed assets could be estimated and its differences among productive systems could be analyzed. To do this, it is useful to separate the purely monetary developments – that are still part of the monetary profitability – from the trends in technical/organizational efficiency. A measure of the capital invested that is almost immune from the distortive effect of inflation over time should be calculated, with the aim to discern to what extent the relative Italian inefficiency is due to (or is alleviated by) inflation. The capital invested at book value is, obviously, affected by the increase in the cost of capital. In international comparisons also the choice of the exchange rate between currencies poses difficult problems[10]. One can wonder to what extent the growth of the Italian ratio of fixed capital over employees, in table 3 of Caprio and Inzerillo (2002), is determined by the domestic inflation outlook over the nineties and even before[11].

It is widely accepted that inflation tends to increase the ROI and the rotation of capital invested. The converse is true for the growth of investment in fixed assets. A policy of accelerated amortization has a negative impact on the net operating revenue, but decreases rapidly the capital invested pushing up the RCF (e.g. during the nineties the share of depreciation over the net fixed assets in Italy was the lowest, among the three countries analyzed, according to Caprio

[10] Fortunately, this is not an issue within the EMU.

[11] Obviously, the figures in table 2, calculated as the ratio of fixed capital at constant prices, taken from national accounts, over employment do not suffer from such a bias. Moreover, they do not show a dramatic increase in capital intensity like the figures in table 3.

and Inzerillo, 2002, table 1). In Italy in the last decade the growth of prices, as measured by the GDP deflator[12], has been nearly 1.5 times that of France and 2.5 times that of Germany. So, the inflation effect should not have been unfavorable, in that period, to the level of Italian RCF if compared to that of the other two economies. However, the disinflationary process of the nineties could have exacerbated the trend of Italian inefficiency over that period. By the year 2000 this process was completed, in the sense that afterwards the inflation outlook remained fairly stable in Italy, and this fact makes the trends of the Italian ratios over the final years of the decade less biased [13].

Revaluating the past batches of fixed assets less depreciation is a possible method to alleviate the bias in the level of ROI and RCF: a bias that should be favorable in Italy as compared to France and to Germany. By doing so, the relative inefficiency of capital utilization in Italy would probably worsen, reflecting a greater disadvantage in terms of technical/organizational/ institutional efficiency, that is alleviated in monetary terms by the faster pace of prices.

Another crucial issue is the interpretation of the apparently lower rotation of net fixed operating assets in Italy, as compared to that of the two biggest EMU countries[14]. One working hypothesis, advanced by Caprio and Inzerillo (2002), is the higher capital intensity of the Italian industry determined by the higher labor cost and by the overwhelming rigidities of the labor market and of the institutional arrangements of industrial relations. While the higher burden of unit labor costs and labor rigidities compared to Germany and France has to be carefully investigated, it is worth examining first the issue of the real nature of the inefficiency in capital utilization. In other terms, is it a matter of choice among different productive processes – on the frontier of the efficient techniques, or of the so called production function – or is it a phenomenon of x-inefficiency, related to the adoption of sub-optimal productive/organizational layouts?

And, if it is – even partially – an issue of x-inefficiency, to what extent is it internal to the productive units or external to them? In other words, to what extent is it a problem related to the internal inefficiency of the "representative" Italian firm – e.g. because of the high fragmentation of the productive process among thousand of small businesses and its lack of coordination, even inside the broad size classes of the BACH, that calls into question the relative

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[12] Clearly, this is not the growth of the cost of fixed assets which are at the denominator of ROI and of RCF – providing in some sense a better measure of the profitability of the monetary capital that could have been invested or utilized in other activities – but could be a proxy of it.

[13] Their level still being (favorably for the ROI and the RCF) influenced by the higher overall inflation than abroad.

[14] Also, another fascinating issue is the extent of the relative Italian ROS disadvantage compared to the other EMU economies, and its interpretation. For space reasons, we do not deal with it here. But clearly it deserves a careful investigation.

economies of scale and scope of the Italian productive system – or is it an issue which involves the overall institutional characteristics of the Italian economy – e.g. the relative backwardness of the national infrastructure, or the weaknesses of the national system of innovation and organizational learning, that calls into question nationwide policies to foster competitiveness? Related to this latter issue is the question whether the lower utilization ratio of fixed capital in Italy is due to a deficiency either in the planning of the expansion of the productive capacity and its optimal layout in face of the trend of demand, or in deploying it quickly to avoid a large part of capital remaining idle over time[15].

[15] Another issue that is worth to investigating is the differential role played by the value of production – at the numerator of RCF – or if the productive inefficiencies of the Italian economy are "quantitative" in nature or "qualitative". That is, if the lower value produced for every euro of fixed capital invested is a matter of technical/organizational inefficiency or an issue related to the type and quality of the product sold in terms of innovation and market power.

Appendix: BACH balance sheet scheme and ratios calculation

Box 1: BACH's balance sheet scheme

Code	BALANCE SHEET - ASSETS	Code	BALANCE SHEET - LIABILITIES
A.	**Subscribed capital unpaid**	**F.**	**Creditors : amounts becoming due and payable within one year**
C.	**Fixed assets**	F.2	Amounts owed to credit institutions
C.1	Intangible fixed assets	F.3	Payments received on accounts of orders
C.1.1	Formation (preliminary) expenses	F.4	Trade creditors
C.1.5*	Other intangible fixed assets	F.10*	Other creditors
C.2	Tangible fixed assets	F.101*	Other financial creditors
C.2.1	Land and buildings	F.102*	Other non financial creditors
C.2.2	Plant and machinery	**I.**	**Creditors : amount becoming due and payable after more than one year**
C.2.3	Other fixtures	I.1	Debenture loans
C.2.4	Payments on account and assets in construction	I.2	Amounts owed to credit institutions
C.3	Financial fixed assets	I.4	Trade creditors
C.3.1/3	Shares in affiliated companies and participating interests	I.10*	Other creditors
C.3.8*	Other financial fixed assets	I.101*	Other financial creditors
D.	**Current assets**	I.102*	Other non financial creditors
D.1	Stocks	**J.**	**Provisions for liabilities and charges**
D.1.1	Raw materials and consumables	J.1*	Provisions for pensions and similar obligations
D.1.4	Payments on account	J.4*	Other provisions
D.1.5*	Other stocks	**K.**	**Accruals and deferred income**
D.2	Debtors	**L.**	**Capital and reserves**
D.2.1	Trade debtors	L.1	Subscribed capital
D.2.7*	Other debtors	L.2	Share premium account
D.3	Current investments	L.3	Revaluation reserve
D.4	Cash at bank and in hand	L.4	Reserves
E.	**Prepayments and accrued income**	L.5	Profit or loss brought forward
AE.*	**Total assets**	L.6	Profit or loss for the financial year
		FL*	**Total liabilities**

* Item not in conformity with the fourth European directive.

Box 2: BACH's profit and loss scheme

Code	PROFIT AND LOSS ACCOUNT
1.	Net turnover
2.	Variation in stocks of finished goods and work in progress
3.	Capitalized production
4.	Other operating income
S.*	**Total operating income**
5.	Cost of materials and consumables
5.a	Raw materials and consumables
5.b	Other external charges
8.	Other operating charges and taxes
T.*	**Added value BACH (S - 5 - 8)**
6.	Staff costs

6.a	Wages and salaries
6.b	Social security costs
U.*	**Gross operating profit (T - 6)**
7.	Value adjustments on non financial assets
7.a	Depreciation on intangible and tangible fixed assets
7.c	Other value adjustments and provisions
V.*	**Net operating profit (U - 7)**
9/11	Financial income
12.	Value adjustments on financial assets
13.	Interest and similar charges
13.a*	Interest paid on financial debts
13.b*	Other financial charges
W.*	Financial income net of charges
X.*	**Profit or loss on ordinary activities before taxes**
16.	Extraordinary income
17.	Extraordinary charges
Y.	Taxes on profits
21.	**Profit or loss for the financial year**

* Item not in conformity with the fourth European directive.

Box 3: calculation of the accounting items and of the ratios

Item	Calculation
IMM - fixed assets	C.1 + C.2
ACO - working operating assets	D.1 + D.2 + D.4 + E
PCO - working operating liabilities	F.3 + F.4 + I.4 + J.1 + K
CCN - net working operating capital	ACO - PCO
CIN - net operating capital invested	IMM + CCN
ROI - return on investment	V / CIN
ROS - return on sales	V / 1.
ROC - rotation of net operating capital invested	1. / CIN
RCC - rotation of net operating working capital	(1. / CCN) x α
RCF - rotation of fixed capital	(1. / IMM) x α

References

Banque de France and European Committee of Central Balance-Sheet Data Offices (2010), *BACH and BACH-ESD: User Guide*, June 2010.

Caprio L. and U. Inzerillo (2002), La redditività delle imprese manifatturiere italiane: un confronto internazionale per settori e classi dimensionali, *in La Competitività dell'Italia, II. Le Imprese, Centro Studi Confindustria*, Il Sole 24 ORE S.p.A. Publishing.

Hale R. (2010), Realism, in *Encyclopædia Britannica*. Retrieved August 09, 2010, from *Encyclopædia Britannica Online*: http://www.britannica.com/EBchecked/topic/493091/realism

Fagerberg J. and Sollie G. (1987), The Method of Constant Market Shares Analysis Reconsidered, *Applied Economics*, 19 (12), pp. 1571-1584.

Guerrieri P. and C. Milana (1990), *L'Italia nel commercio mondiale. Tendenze e cambiamenti nella divisione internazionale del lavoro*, Il Mulino, Bologna.

Iapadre L. (1994), "Fattori strutturali e competitività nel commercio internazionale: una rielaborazione del metodo di analisi constant market shares" in AA.VV., *I processi di internazionalizzazione dell'economia italiana, Atti del Convegno CNR*, Progetto Finalizzato "Servizi e strutture per l'internazionalizzazione delle imprese italiane e sviluppo delle esportazioni", Roma, 24 marzo 1994.

Iapadre L. (2006), Structural Factors and Competitiveness in International Trade: A new Formulation of the Constant Market Share Analysis Method, unpublished manuscript, July 2006.

Lavoie M. (1992), *Foundations of post-Keynesian economic analysis*, Edward Elgar, ISBN 1 85278 322 2.

Milana C. (1988), Constant-Market-Shares Analysis and Index Number Theory, *European Journal of Political Economy*, Vol. 4, No. 4, pp. 453-478.

Richardson J.D. (1971), Constant-Market-Shares Analysis Of Export Growth, *Journal of International Economics*, Vol. 1, Issue 2, pp. 227-239.